Biomass Energy Opportunities on Public Lands

Summary of Key Points:

- New bio-energy plants are unlikely in areas of significant Federal ownership, without a reliable source of raw material to meet the needs of investors.

- Existing BLM timber sale contracts (with completed NEPA analysis) could provide twenty-five times more acres for biomass utilization than current levels. An active forest management and restoration program could provide a potential energy supply of 438 Gigawatt hours.

- Reducing hazardous fuels under the National Fire Plan provides the greatest immediate opportunity to expand biomass production on public lands. Potential energy supply: 219 Gigawatt hours.

- There is a need for a coherent, inter-Departmental strategy to define a successful federal role in renewable energy.

- Forest and woodland inventory should be completed in order to support resource allocation decisions and help determine sustainable supplies of raw material.

- The budget for the Public Domain Forest Management and the Oregon & California Forest Management budgets have declined over 60% (inflation adjusted) since 1981, severely hindering the ability to develop forest and fuels management projects with biomass opportunities.

- An effective biomass strategy on public lands will require a larger cadre of professional foresters and other resource professionals with a clear understanding of current ecosystem science and vegetation management technologies, as well as knowledge and skills to plan, write, coordinate, facilitate and monitor a timely NEPA and ESA process.

- Changes in policy and contracting procedures will help private contractors and the forest products industry determine appropriate products and markets, and yield greater biomass opportunities.

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Availability of Supply

The American Bioenergy Association puts it simply: "biomass is stored solar energy". Therefore wherever vegetation is available, there is a potential supply. Biomass for energy typically includes fuel crops, such as hybrid poplars and switchgrass, agricultural residues such as corn stover, rice straw, wheat straw or other agricultural by-products, municipal solid wastes, and forest residues. For the purposes of this discussion, however, biomass refers primarily to small trees or limbs, tops and other forest residues and woody plants. Similarly, "bioenergy" refers to a broad suite of biomass uses, including combustion for electricity, biomass gasification, conversion to ethanol and bio-diesel production.

There is an important difference between biomass inventory and its availability. While hundreds of millions of tons of biomass may be growing in private and public forests, only a small fraction is actually available. This analysis uses a conservative assumption, based on practical experience, that 50% of all treatment areas have economic, topographic or environmental constraints that make biomass harvest impractical.

There is an immediate opportunity for at least a 25-fold increase in acres available for biomass utilization from existing Bureau of Land Management (BLM) timber sales and fuels reduction projects. The BLM conducts forest products sales on over 10,000 acres per year. Only 2% (217 acres) of these treatments utilized biomass as part of a fuels reduction strategy in Fiscal Year 2001. Removing biomass will reduce hazardous fuels generated by the commercial harvesting operation. Not only does this result in lower hazardous fuels conditions for public lands, and reduce the risks to prescribed or natural fires, it can also reduce or offset the brush disposal costs to timber purchasers.

At the current rate of treatment it will take over 500 years to treat the estimated 12 million acres of forest and woodland restoration needs in Public Domain lands managed by the BLM. Obviously this treatment level is far below the potential and far below the desired level for ecological restoration. If the BLM were to initiate an active 30 year forest and woodland restoration program, the agency would need to treat 150,000 acres a year. A combined program of forest management and forest restoration treatments would mean a 360-fold increase in biomass harvest over current production levels (80,000 acres vs. 217 acres per year).

Table 1 – Forest Management and Restoration Opportunities for Biomass Production

Type	Total Acres	Annual Acres Available	Acres Suitable*
Existing Contracts	10,000	N/A	5,000
Forest Management	10,000	10,000	5,000
Forest Restoration	12,000,000	150,000	75,000
Totals	12,020,000	160,000	80,000

* assumes 50% of the acres available are suitable for biomass production.

At a crude, estimated conversion rate of 8,000 Bone Dry Tons (BDT) to one megawatt year, and five BDT per acre, this represents a potential energy source of 50 Megawatt years, or 438 Gigawatt hours. NREL conversion factors indicate this would replace approximately 200,000 tons of coal.

Opportunities

In June 2001, Secretary Norton told the House Committee on Resources:

> " *...Utilization of biomass for energy production is consistent with a National Energy Policy objective to increase America's use of renewable and alternative energy sources. Biomass utilization is also consistent with the goals and objectives of the National Fire Plan to reduce accumulations of woody material that create a fire hazard, threatening communities and forests and rangelands....*"

By far the greatest opportunity for producing biomass on public lands is by reducing hazardous fuels under the National Fire Plan. To a high degree, the woody fuels which are typically used in bioenergy are the same materials which contribute to the rapid spread of wildfires or are ladder fuels which allow for damaging crown fires.

The Bureau of Land Management has estimated that there are some 110 to 130 million acres of lands at high risk and another 85 to 105 million acres at moderate risk to catastrophic damage by wildfire. The Department of Agriculture has estimated 73 million acres of forested USDA Forest Service lands are at moderate to high risk of catastrophic wildfire (Report to the President, September 9, 2000). Biomass production using the types of equipment available today is economically and technically feasible on only a small portion of theses lands. Other constraints include the types of fuels to be treated (mostly in shrub and grasslands), access to markets, conflicting land use allocations, and environmental concerns.

Table 2 – Fuels Treatment Opportunities for Biomass Production

Public Agency	Acres at moderate to high risk of catastrophic wildfire	Fuels treatment acres planned in FY2002	Acres potentially available for biomass*
BLM	28,000,000	125,000 WUI 275,000 landscape	40,000
BIA	21,000,000	176,000	17,000
NPS	3,000,000	196,000	17,000
USFWS	800,000	326,000	5,000
USFS	73,000,000	1,350,000	675,000

* assumes 50% of the acres available are suitable for biomass production.

At a crude, estimated conversion rate of 8,000 Bone Dry Tons (BDT) to one megawatt year, and five BDT per acre, the BLM portion of this represents a potential energy source of 25 Megawatt years, or 219 Gigawatt hours. NREL conversion factors equate this to approximately 100,000 tons of coal.

Specific Examples of BLM Opportunities:

- The Alturas and Eagle Lake Field Offices in northeastern California have experience in biomass projects on forested lands and are now proposing a juniper restoration project. This proposal, if successful, has outstanding possibilities throughout the 37 million acres of BLM's woodlands. Northeastern California has an active biomass industry, with well-established infrastructure, so the probability of success is very high.

- The Montana State Director has identified a pro-active forest restoration program which, if funded, could provide a 900% increase in restoration treatments. Proposed as a long-term (over 60 years) restoration program, this is the type of commitment which will attract investments in biomass infrastructure.

- The Ely District in eastern Nevada has committed to produce over 50-100,000 tons per year of pinyon-juniper biomass products as part of their Eastern Nevada Landscape Restoration Coalition (Coalition) project. The Coalition involves 75 federal, State, and local governments, private foundations and environmental groups, and local community and industry leaders. Designed to restore and improve habitat for sage grouse and Rocky Mountain elk, the project will treat over 18,000 acres of woodlands in FY 2002.

External Opportunities

Twelve States have Renewable Portfolio Standards which require a certain percentage of the State energy portfolio must come from renewable energy. In the West, for example, Nevada requires 5% renewables by 2003 and 15% renewables by 2015. New Mexico and Arizona have less ambitious programs, at 5% and 1.1% respectively. California had a similar program several years ago which encouraged the development of a biomass industry and infrastructure, and is expected to have a new program in place within a year.

Several States and the U.S. Congress have looked at price supports for renewable energy. One proposal would give grants to companies which remove hazardous fuels under the National Fire Plan as biomass feedstock. Tax credits and energy surcharges have also been explored. These types of supports should be encouraged, as they go a long way towards reducing private investor risks and encouraging biomass supplies.

Communication Barriers

Perception

Land managers are generally unaware of the full range of tools available to solve ecological restoration and forest or woodland health problems. Often times there is a failure to recognize new or different approaches. For example, many managers think that it costs less to treat an acre of forest by prescribed fire compared to mechanical removal of small trees. This is frequently untrue, especially when considering the risks of escaped fire to adjacent communities and critical habitat areas and the uncertainty of protecting valuable resources and large trees. For example, biomass operations on the Eagle Lake Ranger District of the Lassen National Forest yielded a gross average return to the government of $146.65/acre (ten year average from 30 sales, range of $5.88 to $647.59 per acre) on a total of 15,732 acres of treatments . The costs of similar treatments, using a series of prescribed burns in a forested environment range from $100 to $400/acre. Thus the net difference between mechanical treatment over prescribed fire is $146 + $100 to $400 (savings by not burning) = $246 to $546/acre. This doesn't include the social values of reduced smoke pollution and the aesthetics of unburned small or large trees.

There is a common perception that forestry activities are damaging to the environment. However, soil disturbance, because of the type of equipment used and small size trees with wide weight distribution area, is minimal. Biomass harvesting typically uses medium-sized mechanical shears with a grapple to hold the tree. The operator then cuts or shears the tree and carries the tree and lays it in a bundle. By controlling the direction of fall, there is minimal damage to desired residual trees. Therefore, compared to prescribed burning, research indicates a greater level of precision of application can be achieved through the biomass operation. Mechanical harvest also provides an opportunity to save specific trees or groups of vegetation for wildlife cover. The results of these biomass treatments, seen in Figure 1, are

similar to the treatment objectives of a series of prescribed fire.

Supply

Because of the controversial nature of "traditional" forestry practices, many public land managers have avoided an active forest or woodland management program. Even restoration work involving only the cutting of small trees has had little support by land managers. Members of most environmental organizations resist any forestry work – even ecological restoration – if it involves a commercial venture. The environmental community refers to this as a "perverse incentive" to cut trees. The reasons for these feelings are many, but generally stem from a lack of trust or understanding of the professional forestry.

Figure 1: This eastside pine stand was biomass thinned to improve goshawk habitat one month prior to photo. Note the dense, unthinned stand in background. Photo courtesy of Eagle Lake R.D., Lassen National Forest

For biomass opportunities to expand, there is a need for a focused outreach and education program on the costs and benefits of biomass utilization targeted toward agency managers, environmental organizations, and the general public.

Technical Knowledge

Most people, even professional foresters and field technicians in forest and woodland management, are unaware of the potential benefits and the wide range of field conditions where biomass harvesting is both practical and economical. Even seasoned forest managers are reluctant to utilize this valuable tool in reducing hazardous fuels or conducting commercial thinnings. Forest managers need information on equipment limitations, contract requirements and contract administration, markets and economies for the wide spectrum of forest products (often called "multi-products") which contribute to the long-term success of a healthy biomass products industry.

Outreach

For a biomass program to be successful on public lands an outreach and education program needs to be conducted with a target audience of agency managers, environmental organizations, and the general public. The objective would be to provide information on the state-of-the-art technology which is available to utilize small diameter wood by-products and the many benefits which biomass thinning can provide.

Administrative Barriers

Inventory

Most of the BLM forest and woodlands have not had an activity or Plan level inventory for over 25 years. Another important barrier is that there is no consistent method for inventory of woodland resources which play a major role in the biomass picture. The lack of credible, consistent data is acknowledged both inside and outside the agency.

Without this basic inventory data, it is difficult to make an accurate calculation of the sustainable supply of biomass feedstock. Based on the extraordinary mortality occurring throughout the Public Domain, it is obvious that much work needs to be done to reverse the overstocked forest conditions. There is credible evidence to support immediate restoration efforts. However, in order to support resource allocation decisions, a comprehensive inventory should start immediately.

There is an opportunity to explore the use of the Forest Inventory and Analysis (FIA) data from the USDA Forest Service. The FIA data is multi-agency in scope, relatively inexpensive, and at relatively minor costs can be adapted to provide the type of information necessary to address questions of biomass feedstock locations and quantities on BLM managed lands. The FIA data protocols are currently being revised to include measures of smaller trees and will also provide estimates of biomass in bone dry tons. BLM should support, both in staffing and budgeting, this important program.

NEPA/ESA

Compliance with National Environmental Policy Act (NEPA) and Endangered Species Act (ESA) requirements have often slowed the ability to offer forest and woodland management or restoration projects. These requirements lead to better informed decisions, and are simply "process" issues and not "barriers". Much of the delays are due to inadequate staffing by both BLM and the consultation agencies: the U.S. Fish and Wildlife Service and the National Marine Fisheries Service. Interagency efforts are currently underway to expedite these consultation procedures.

There is also a critical shortage in skills to plan, write and coordinate NEPA and ESA compliance. This leads to poor quality documents, increased vulnerability to appeals and litigation, and considerable re-work. Failure to utilize public scoping through local Resource Advisory or Fire Safe Councils may mean missed opportunities to use Categorical Exclusions, or Environmental Assessments rather than a lengthy Environmental Impact Statement. The end result is a low return on investment. This process can be so complex that it discourages attempting even simple projects such as biomass thinning.

Budget

The budget for BLM's Public Domain Forest Management Program has declined almost 64% (inflation adjusted) since 1981, and over 37% in real dollars (please see Figure #2). A similar pattern is found in the budget for the O&C Forest Management program, which has declined over 60% (inflation adjusted) since 1981, and over 31% in real dollars. This decline in funding has lead to a skeletal program that funds approximately 50 Foresters to manage 48 million acres of forest land. There is virtually no discretionary funding available to do project work within the base PD Forest Management Program.

Specific forest health projects in the BLM are currently being funded by the Forest Ecosystem Health and Recovery Fund (FEHRF), a permanent operating fund authorized by Congress in 1993. The FEHRF, which currently has a balance of approximately $4.5 million, meets only about one-third of the forest restoration project funding needs identified in Fiscal Year 2002. However, since the Public Domain Forest Management budget covers the base funding for forestry personnel, this has a direct effect on the ability of the BLM to respond to new salvage, fuel hazard reduction and/or forest health situations which provide biomass opportunities.

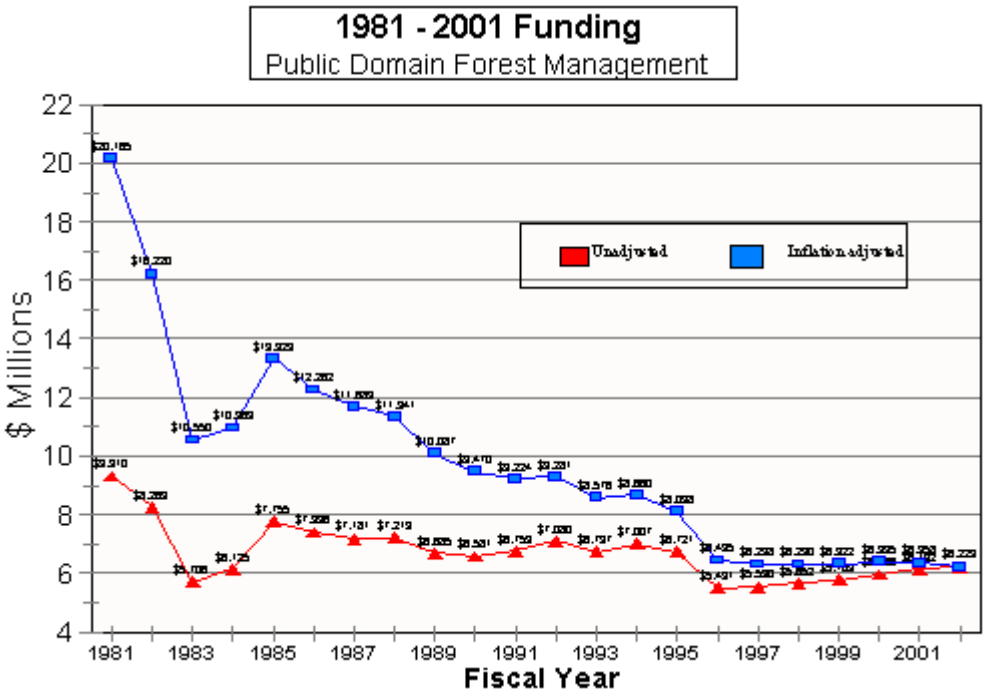

Figure 2: BLM Public Domain Forest Management Budget

Staffing

The number of professional foresters (460 series) employed by the BLM has declined by 44% from 1991 to 1999 (please see Figure #3). During this same time the Foresters job, both in the woods and in the office, has become far more complex. Federal land management agencies have made a fundamental shift in forest management practices in the last ten to fifteen years. Over the last decade, the BLM Public Domain Forest Management Program has shifted from a timber production emphasis that extensively used clear-cutting to extract timber resources, to emphasizing forest health and restoration practices. This emphasis on actively restoring forest health will also provide excellent opportunities for biomass feedstock

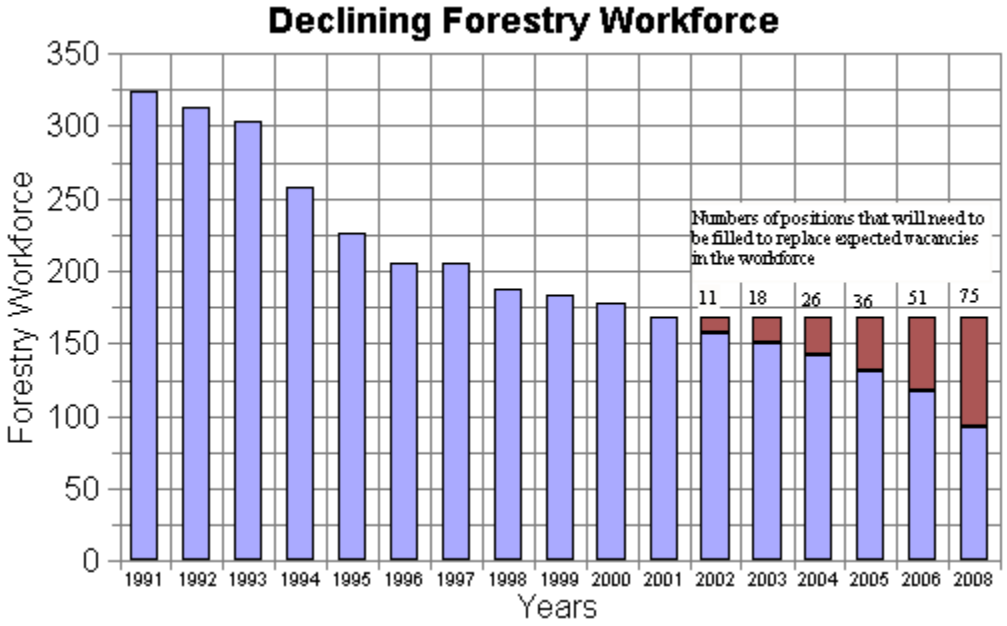

Figure 3: BLM Forester Worforce

Many of BLM's current Foresters were hired in the mid-1970's during the big staffing push to meet the needs of NEPA and the Federal Land Policy and Management Act (FLPMA) for interdisciplinary approaches to natural resource management. As such, these employees are now in their mid- to late-careers. It is estimated that over 75% of BLM's foresters will be eligible for retirement within the next seven years. There are three primary concerns resulting from this demographic dilemma: BLM's ability to make science-based management decisions for management of forested lands, the loss of corporate knowledge, and BLM's ability to develop highly skilled employees.

The first concern is that without a workforce that is knowledgeable of forest dynamics and forest health issues that are in the forefront of forest resource management throughout the western U.S., and without the skills to design, analyze and implement restoration actions to improve forest health, BLM will not be capable of meeting it's forest stewardship responsibilities.

The second concern is that the loss of BLM's "experienced", or senior employees, who have in-depth knowledge of the resources, constituents and processes/practices which have been acquired and refined over many years of practical work experience, will jeopardize BLM's ability to effectively train and mentor new Foresters.

Finally, most of the key positions in a field office take many years of experience to develop the necessary skills to perform their job effectively. For example, in Timber Sale Administration it takes many years of field work to become proficient in sale administration skills, layout, marking and cruising and contract preparation for biomass thinning projects. There are numerous other examples in critical skill areas such as silviculture and planning.

Figure 4: An ecological research treatment at Blacks Mountain Experimental Forest. Note the high diversity of the forest.

Besides needing to hire new Foresters, BLM needs to improve the skills and keep current with technological advances for existing employees. Specifically, BLM needs training in contract administration, vegetation ecology and silvics, ecosystem management, and technical advances in GIS, GPS and inventory. BLM also needs proficiency in project planning and design which integrates aquatic conservation strategies, ecosystem management and RMP decisions.

Market Barriers

Research

Bioenergy research has suffered from a lack of attention and under-funding. As a result, new and creative technologies have not been fully explored. For example, biogasification – the process of converting biomass into syngas for use in advanced technologies or for chemical conversion to liquid

fuel – has tremendous potential as a clean fuel source. This technology has only been applied in a few places in the U.S., but is used throughout Western Europe.

Large-scale bio-ethanol plants require tens of millions of dollars of investment and need long-term fuel supplies guaranteed. Studies for market and supply feasibility are lacking. Industry has been hesitant in developing this promising, but potentially risky field. There are numerous other potential markets for woody biomass. Development research that bridges the gap between the possible and the actual is badly needed.

Supply

Aside from the issues of economic feasibility and equipment operability discussed earlier, the most significant market barrier to increasing biomass production from Federal lands is the uncertainty of biomass supplies. While there are tens of millions of acres in need of biomass thinning or fuel hazard reduction, until recently there has not been a long-term strategic plan (the National Fire Plan) to address this forest and woodland health issue. There has not been a corresponding effort to develop a strategic plan for biomass marketing and utilization.

Private sector investors are reluctant to invest in a bio-energy plant in areas where the Federal government is the principal supplier of raw material. Principally as a result of changing legal and institutional interpretations of environmental laws or regulations, and appeals and litigation, federal supplies have been erratic at best. Industry representatives have indicated that the rule thumb for private investors is to reduce federal supply estimates by 60% to compensate for these fluctuations. Considering the need for a long-term (20+ years) investment in infrastructure, new bio-energy plants are unlikely in areas of significant federal ownership, unless a dependable source of raw material can be guaranteed. The problem of attracting industry to these in areas is magnified when there is a weak support infrastructure (trucking and logging operators, road and/or rail systems) and/or an inadequate variety of forest product manufacturers. In many areas of the West this forest-based industrial infrastructure is already gone.

Contracting Restrictions

There is a general distrust of single unit pricing, a method of selling all forest products at one single rate, by federal Contracting Officers . Many feel that they will get a higher return by pricing sawlog material at one rate and biomass material at another. This discourages “multi-product” sales, in which the Purchaser determines how, and in what form, the products are marketed and removed. Often times a Purchaser will desire to change utilization specifications based on current conditions: small sawlogs (trees less than 18 inches in diameter) are usually processed for studs or low grade lumber; trees from 6 to 14 inches in diameter, are often utilized for “clean chips” for pulp and paper-making, or may be made into veneer lumber for plywood or manufactured lumber products. The residual tops, limbs, bark and trees less than 8 inches, are then utilized as “biomass”. In this example, without single unit pricing, trees over a certain utilization standard (say 10 inch minimum for saw logs) must be removed in a specified form (sawlog). This discourages competition, reduces bid values, and increases contract inspection costs to ensure the contract utilization standards are followed. Under single unit pricing, economic and market conditions determine the most cost effective product mix, not the government Contracting Officer.

Federal managers have moved to “tree measurement” or “lump sum” sales, where forest product quantities are determined prior to sale. The risk of an inaccurate quantity is borne by the Purchaser.

Historically, many sales were sold with estimated volumes, which cost less to prepare because the statistical standards were lower. Forest products were then "scaled" and the Purchaser was billed for the actual quantity removed. The process used for scaling was often expensive and required increased sale administration costs to ensure that the contract utilization standards were followed. With sales based on weight, unit costs for scaling are significantly reduced for both the government and the Purchaser. When weight scaling is combined with single unit pricing, government contract administration costs and the risk of poor utilization are virtually eliminated. The risk of timber theft in transportation is also reduced, allowing the sale administrator to spend more time in the woods, where they should be focusing. Purchasers also bid higher values due to lower scaling costs and less risk in determining the final amount of wood products to be removed.

Stewardship Contracts

The USDA Forest Service has been given special, temporary authority to use a variety of innovative authorities such as "goods for services" contracts and local retention of receipts to do forest restoration work which has limited commercial value. The focus of the work is usually forest thinning, fuel hazard reduction and watershed improvement. Under "goods for services" some small trees and biomass are removed and "traded" against the value of the services provided. This stewardship authority could be invaluable in situations where there are limited commercial products, as is the case with many biomass thinning projects. The BLM does not have this authority, however, it would be a useful tool for forest and woodland restoration.

The USDA Forest Service is also using service contracts with embedded timber sales under their existing contract authorities. Funds received under the sale are kept separate from those used to pay for the services and are transferred directly to the U.S. Treasury. This avoids the appearance that the agency is re-directing appropriations. BLM needs the authority to pursue a variety of contracting avenues to avoid the concern about funding "augmentation" (per Comptroller General decision).

Contacts and References

The following individuals provided advice or comments on the preparation of this paper:
Tad Mason, TSS Consultants
Mark Nechodom, USDA Forest Service, PSW Experiment Station
Larry Swann, USDA Forest Service, Winema National Forest
Mike Haske, BLM, Deputy Group Manager, Fish, Wildlife and Forests Group (WO-230)
Rick Tholen, BLM, Forest Health Program Manager, Fish, Wildlife and Forests Group (WO-230)
John Sebelius, USDA Forest Service (on detail to White House Energy Streamlining Task Force)
Al Vazquez, Bob Andrews, Rod Vineyard, Don Dockery, USDA Forest Service, Eagle Lake RD
Mike Kossey, USDA, Rural Utility Service
Bill Von Sagan, USDA Forest Service

Reference materials used in this paper:

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* Barriers to biomass production on National Forests (draft report by Mark Necodom and Tad Mason)

* Forest Biomass for Energy, Safety and Forest Health (draft report by USFS)